

AMENDMENTS

In the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Original) A image sensor with a vertically integrated thin-film photodiode, comprising:
 - a substrate;
 - an interconnection structure adjacent to the substrate, wherein the interconnection structure includes a top metal layer comprising a plurality of first metal pads for thin-film photodiodes and a second metal pad for a ground pad;
 - a dielectric layer with a plurality of first openings and a second opening disposed on the interconnection structure;
 - a plurality of bottom doped layers with a first conductive type respectively disposed in the first openings, wherein each bottom doped layer contacts the corresponding first metal pad without extending outside the surface of the corresponding first metal pad;
 - an I-type layer disposed over at least one bottom doped layer and the dielectric layer;
 - an upper doped layer with a second conductive type disposed over the I-type layer; and
 - a transparent electrode disposed over the upper doped layer and contacting the second metal pad through the second opening in the dielectric layer.

2. (Original) The image sensor with a vertically integrated thin-film photodiode of claim 1, wherein the thin-film photodiodes are PIN photodiodes.

3. (Original) The image sensor with a vertically integrated thin-film photodiode of claim 1, further comprising a passivation layer covering the transparent electrode and the dielectric layer.

4. (Original) The image sensor with a vertically integrated thin-film photodiode of claim 3, further comprising a bonding opening passing through the passivation layer and the dielectric layer to the second metal pad.

5. (Original) The image sensor with a vertically integrated thin-film photodiode of claim 1, wherein the size of each first opening is about $0.5\mu\text{m} \times 0.5\mu\text{m} \sim 20\mu\text{m} \times 20\mu\text{m}$.

6. (Original) The image sensor with a vertically integrated thin-film photodiode of claim 1, wherein each bottom doped layer is conformally disposed in the corresponding first opening.

7. (Original) A image sensor with a vertically integrated thin-film photodiode, comprising:

a substrate having a ground pad region, a pixel array region and a ASIC circuit region;
an interconnection structure adjacent to the substrate, wherein the interconnection structure includes a top metal layer comprising a plurality of pixel electrodes in

the pixel array region, a ground pad in the ground pad region and a circuit pad in the ASIC circuit region;

a dielectric layer with a plurality of first openings and a second opening disposed on the interconnection structure, wherein a bottom of each first opening is a surface of the corresponding pixel electrode;

a plurality of bottom doped layers with a first conductive type respectively disposed in the first openings, wherein each bottom doped layer contacts the corresponding pixel electrode;

an I-type layer disposed over at least one bottom doped layer and the dielectric layer;

an upper doped layer with a second conductive type disposed over the I-type layer; and

a light transmitting electrode disposed over the upper doped layer and contacting the second metal pad through the second opening in the dielectric layer.

8. (Original) The image sensor with a vertically integrated thin-film photodiode of claim 7, wherein the thin-film photodiodes are PIN photodiodes.

9. (Original) The image sensor with a vertically integrated thin-film photodiode of claim 7, further comprising a passivation layer covering the light transmitting electrode and the dielectric layer.

10. (Original) The image sensor with a vertically integrated thin-film photodiode of claim 9, further comprising a first bonding opening passing through the passivation layer and the dielectric layer to the ground pad, and a second bonding opening passing through the passivation layer and the dielectric layer to the circuit pad.

11. (Original) The image sensor with a vertically integrated thin-film photodiode of claim 7, wherein the size of each first opening is about $0.5\mu\text{m} \times 0.5\mu\text{m} \sim 20\mu\text{m} \times 20\mu\text{m}$.

12. (Original) The image sensor with a vertically integrated thin-film photodiode of claim 7, wherein each bottom doped layer is conformally disposed in the corresponding first opening.

13. – 20. (Canceled)